Amendments to the Claims

The following listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) An apparatus for detecting an analyte or measuring a property of an analyte, comprising:

   a) at least one suspended beam connected to at least one ~~two~~ mechanically stable ~~supports~~ support, wherein the beam contains one or more microfluidic channels, and wherein each microfluidic channel has at least one chemical species that binds to or reacts with the analyte~~; and~~

   ~~b) one or more detectors for measuring a change in the one or more beams upon binding or reaction of the analyte~~.

2. (Currently Amended) The apparatus of Claim [[1]] 161, wherein the chemical species is a capture ligand that binds to the analyte.

3. (Original) The apparatus of Claim 2, wherein the one or more beams are resonating and the detector measures changes in resonance frequency of the beam.

4. (Original) The apparatus of Claim 3, wherein the capture ligand is bound to the interior surface of the microfluidic channel.

5. (Original) The apparatus of Claim 3, further comprising a gel in the microfluidic channel, wherein the capture ligand is bound to the gel.

6. (Original) The apparatus of Claim 5, wherein the beam has two microfluidic channels that meet in a region containing a polymerized gel then separate downstream from the gel.

7. (Original) The apparatus of Claim 6, wherein the analyte is transported into the gel via pressure from the fluid flow.

8. (Original) The apparatus of Claim 6, wherein the analyte is transported into the gel via electrophoresis.

9. (Original) The apparatus of Claim 3, wherein the resonance of each beam is driven by a pair of electrodes.

10. (Original) The apparatus of Claim 9, wherein one of the electrodes of the electrode pair is common to all the beams and the other electrode of the electrode pair is separately addressable for each beam.

11. (Original) The apparatus of Claim 10, wherein the electrodes are a metal that is, independently, selected from the group consisting of gold, nickel, platinum, aluminum, copper, antimony, tin, indium, chromium, titanium, and alloys thereof.

12. (Original) The apparatus of Claim 11, wherein the electrodes are gold.

13. (Original) The apparatus of Claim 10, wherein the common electrode is in contact with the each beam.

14. (Original) The apparatus of Claim 10, wherein the solution in the microfluidic channel is an electrolyte solution and the electrolyte solution is the common electrode.

15. (Original) The apparatus of Claim 3, wherein the one or more detectors are one or more capacitors.

16. (Original) The apparatus of Claim 15, wherein the drive electrodes are also used as a capacitive detectors.

17. (Original) The apparatus of Claim 16, wherein one of the two capacitor plates of each capacitive detector is in contact with the surface of the beam.

18. (Original) The apparatus of Claim 3, wherein the detector is an optical lever or a laser vibrometer.

19. (Original) The apparatus of Claim 3, wherein the capture ligand is a nucleic acid.

20. (Original) The apparatus of Claim 19, wherein the capture ligand is a single stranded DNA.

21. (Original) The apparatus of Claim 19, wherein the capture ligand is double stranded DNA.

22. (Original) The apparatus of Claim 3, wherein the capture ligand is a protein, peptide or a protein nucleic acid (PNA).

23. (Original) The apparatus of Claim 22, wherein the capture ligand is an antibody or an antibody fragment.

24. (Original) The apparatus of Claim 3, wherein the capture ligand is an antigen.

25. (Original) The apparatus of Claim 22, wherein the capture ligand is a lectin.

26. (Original) The apparatus of Claim 3, wherein the capture ligand is a carbohydrate.

27. (Original) The apparatus of Claim 26, wherein the capture ligand is a sugar residue.

28. (Original) The apparatus of Claim 2, wherein the detector measures the conductivity of the microfluidic channel.

29. (Original) The apparatus of Claim 2, wherein the detector measures deformation of the beam.

30. (Original) The apparatus of Claim 29, wherein capture ligand is bound to the interior surface of the microfluidic channel, and wherein there is a substantially higher concentration of capture ligand on one side of the microfluidic channel than on the opposite side.

31. (Original) The apparatus of Claim 29, wherein the one or more detectors are one or more capacitors.

32. (Original) The apparatus of Claim 31, wherein one of the two capacitor plates of each capacitive detector is in contact with the surface of the beam.

33. (Original) The apparatus of Claim 29, wherein the detector is an optical lever.

34. (Original) The apparatus of Claim 29, wherein the capture ligand is a nucleic acid.

35. (Original) The apparatus of Claim 34, wherein the capture ligand is a single stranded DNA.

36. (Original) The apparatus of Claim 34, wherein the capture ligand is double stranded DNA.

37. (Original) The apparatus of Claim 29, wherein the capture ligand is a protein, peptide or a protein nucleic acid (PNA).

38. (Original) The apparatus of Claim 37, wherein the capture ligand is an antibody or an antibody fragment.

39. (Original) The apparatus of Claim 29, wherein the capture ligand is an antigen.

40. (Original) The apparatus of Claim 29, wherein the capture ligand is a lectin.

41. (Original) The apparatus of Claim 40, wherein the capture ligand is a carbohydrate.

42. (Original) The apparatus of Claim 41, wherein the capture ligand is a sugar residue.

43. (Original) The apparatus of Claim 1, wherein the depth of the one or more microfluidic channels is in the range of between about 100 nm and about 3000 nm.

44. (Original) The apparatus of Claim 43, wherein the walls of the microfluidic channel have a thickness in the range of between about 100 nm and 1200 nm.

45. (Original) The apparatus of Claim 44, wherein an inlet to the microfluidic channel is connected to a sample fluid channel having a depth in the range of between about 10 μm and about 100 μm.

46. (Original) The apparatus of Claim 1, wherein the beam is suspended in a low pressure environment.

47. (Currently Amended) ~~An~~ The apparatus of Claim 1 ~~for detecting an analyte or measuring a property of an analyte~~, further comprising:

~~a) a device structure having at least one suspended beam that contains one or more microfluidic channels, wherein each microfluidic channel has at least one chemical species that binds to or reacts with the analyte; and~~

~~b)~~ a sample fluid channel connected to the inlet of at least one of the microfluid channel, wherein the sample fluid channel has a depth that is substantially larger than the microfluidic channel.

48. (Original) The apparatus of Claim 47, wherein the apparatus is a micro-electro-mechanical system (MEMS) having a packaging structure that covers the device region.

49. (Original) The apparatus of Claim 48, wherein each of the microfluidic channels has a depth in the range of between about 100 nm and about 3000 nm, and each of the sample fluid channels has a depth in the range of between about 10 μm and 100 μm.

50. (Original) The apparatus of Claim 49, wherein the walls of the microfluidic channel have a thickness in the range of between about 100 nm and 1200 nm.

51. (Original) The apparatus of Claim 49, wherein the sample fluid channels are patterned in the packaging structure.

52. (Original) The apparatus of Claim 51, wherein the chemical species is a capture ligand that binds to the analyte.

53. (Currently Amended) The apparatus of Claim 52, further including one or more detectors for measuring a change in the one or more beams upon binding or reaction of the analyte.

54. (Original) The apparatus of Claim 53, wherein the one or more beams are resonating and the detector measures changes in resonance frequency of the beam.

55. (Original) The apparatus of Claim 54, wherein the suspended beam is a cantilever.

56. (Original) The apparatus of Claim 54, wherein the suspended beam is connected to two mechanically stable supports.

57. (Original) The apparatus of Claim 54, wherein the capture ligand is bound to the interior surface of the microfluidic channel.

58. (Original) The apparatus of Claim 54, further comprising a gel in the microfluidic channel, wherein the capture ligand is bound to the gel.

59. (Original) The apparatus of Claim 56, wherein the beam has two microfluidic channels that meet in a region containing a polymerized gel then separate downstream from the gel, wherein the gel comprises a capture ligand.

60. (Original) The apparatus of Claim 59, wherein the analyte is transported into the gel via pressure from the fluid flow.

61. (Original) The apparatus of Claim 59, wherein the analyte is transported into the gel via electrophoresis.

62. (Original) The apparatus of Claim 54, wherein the resonance of each beam is driven by a pair of electrodes.

63. (Original) The apparatus of Claim 62, wherein one of the electrodes of the electrode pair is common to all the beams and the other electrode of the electrode pair is separately addressable for each beam.

64. (Original) The apparatus of Claim 63, wherein the electrodes are a metal, independently, selected from the group consisting of gold, nickel, platinum, aluminum, copper, antimony, tin, indium, chromium, titanium, and alloys thereof.

65. (Original) The apparatus of Claim 64, wherein the electrodes are gold.

66. (Original) The apparatus of Claim 63, wherein the packaging structure comprises the separately addressable electrodes.

67. (Original) The apparatus of Claim 66, wherein the common electrode is in contact with the each beam.

68. (Original) The apparatus of Claim 66, wherein the solution in the microfluidic channel is an electrolyte solution and the electrolyte solution is the common electrode.

69. (Original) The apparatus of Claim 54, wherein the one or more detectors are one or more capacitors.

70. (Original) The apparatus of Claim 69, wherein the drive electrodes are also used as a capacitive detector.

71. (Original) The apparatus of Claim 70, wherein one of the two capacitor plates is in contact with the surface of the beam.

72. (Original) The apparatus of Claim 71, wherein the packaging structure comprises a substrate made of a material selected from the group consisting of glass, a ceramic, a plastics, a circuit board, and a silicon chip.

73. (Original) The apparatus of Claim 54, wherein the one or more detectors are optical lever detectors or laser vibrometers.

74. (Original) The apparatus of Claim 72 or 73, wherein the substrate is bound to the MEMS via a polydimethylsiloxane gasket.

75. (Original) The apparatus of Claim 74, wherein the connection between the microfluidic channels and the sample fluid channels are patterned in the polydimethylsiloxane gasket.

76. (Original) The apparatus of Claim 77, wherein the common electrode is a patterned metallic layer on the surface of the MEMS that is bound to the gasket.

77. (Original) The apparatus of Claim 72 or 73, wherein the substrate is glass or a silicon chip and is bound to the MEMS via anodic bonding.

78. (Original) The apparatus of Claim 77, wherein the connection between the microfluidic channels and the sample fluid channels are patterned in the substrate.

79. (Original) The apparatus of Claim 78, wherein the common electrode is a patterned metallic layer on the surface of the MEMS that is bound to the substrate.

80. (Original) The apparatus of Claim 72 or 73, wherein substrate is bound to the MEMS via

a patterned metallic layer.

81. (Original) The apparatus of Claim 80, wherein the connection between the microfluidic channels and the sample fluid channels are patterned in the metallic layer.

82. (Original) The apparatus of Claim 53, wherein the capture ligand is a nucleic acid.

83. (Original) The apparatus of Claim 82, wherein the capture ligand is a single stranded DNA.

84. (Original) The apparatus of Claim 82, wherein the capture ligand is double stranded DNA.

85. (Original) The apparatus of Claim 53, wherein the capture ligand is a protein, peptide or a protein nucleic acid (PNA).

86. (Original) The apparatus of Claim 85, wherein the capture ligand is an antibody or an antibody fragment.

87. (Original) The apparatus of Claim 53, wherein the capture ligand is an antigen.

88. (Original) The apparatus of Claim 53, wherein the capture ligand is a lectin.

89. (Original) The apparatus of Claim 53, wherein the capture ligand is a carbohydrate.

90. (Original) The apparatus of Claim 89, wherein the capture ligand is a sugar residue.

91. (Original) The apparatus of Claim 53, wherein the detector measures deformation of the beam.

92. (Original) The apparatus of Claim 53, wherein capture ligand is bound to the interior surface of the microfluidic channel.

93. (Original) The apparatus of Claim 92, wherein there is a substantially higher concentration of capture ligand on one side of the microfluidic channel than on the

opposite side.

94. (Original) The apparatus of Claim 92, wherein a surface of the beam is coated with a material having a different coefficient of thermal expansion from that of the beam.

95. (Original) The apparatus of Claim 93 or 94, wherein the one or more detectors are one or more capacitors.

96. (Original) The apparatus of Claim 95, wherein the packaging structure comprises one of the capacitor plates of each capacitor and the other capacitor plate is in contact with the surface of the suspended beam.

97. (Original) The apparatus of Claim 9, wherein the one or more detectors are optical lever detectors.

98. (Original) The apparatus of Claim 92, wherein the capture ligand is a nucleic acid.

99. (Original) The apparatus of Claim 98, wherein the capture ligand is a single stranded DNA.

100. (Original) The apparatus of Claim 98, wherein the capture ligand is double stranded DNA.

101. (Original) The apparatus of Claim 92, wherein the capture ligand is a protein or peptide.

102. (Original) The apparatus of Claim 101, wherein the capture ligand is an antibody or an antibody fragment.

103. (Original) The apparatus of Claim 92, wherein the capture ligand is an antigen.

104. (Original) The apparatus of Claim 92, wherein the capture ligand is a lectin.

105. (Original) The apparatus of Claim 92, wherein the capture ligand is a carbohydrate.

106. (Original) The apparatus of Claim 105, wherein the capture ligand is a sugar residue.

107. (Original) A semiconductor wafer comprising more than one apparatus of Claim 48.

108. - 160. (Cancelled).

161. (New) The apparatus of Claim 1, further comprising one or more detectors for measuring a change in the one or more beams upon binding or reaction of the analyte.

162. (New) The apparatus of Claim 1, wherein the one or more beams is in a controlled environment.